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(54) **FLOW PATH MEMBER, LIQUID EJECTING HEAD, AND LIQUID EJECTING APPARATUS**

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(58) **Field of Classification Search**
None
See application file for complete search history.

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(57) **ABSTRACT**

There is provided a flow path member including a flow-path member main body which is provided with a liquid supplying path through which liquid is supplied to a head main body that ejects liquid and an attaching portion to which a liquid supplying unit that supplies liquid of the liquid supplying path is attached; and a sealing member which is provided with an insertion hole into which the attaching portion is inserted, and is interposed between the liquid supplying unit and the attaching portion, in which a convex portion is provided in any one of the inner surface of the insertion hole and the outer surface of the attaching portion, and a concave portion that fits with the convex portion is provided in the other of the inner surface of the insertion hole and the outer surface of the attaching portion.

20 Claims, 10 Drawing Sheets

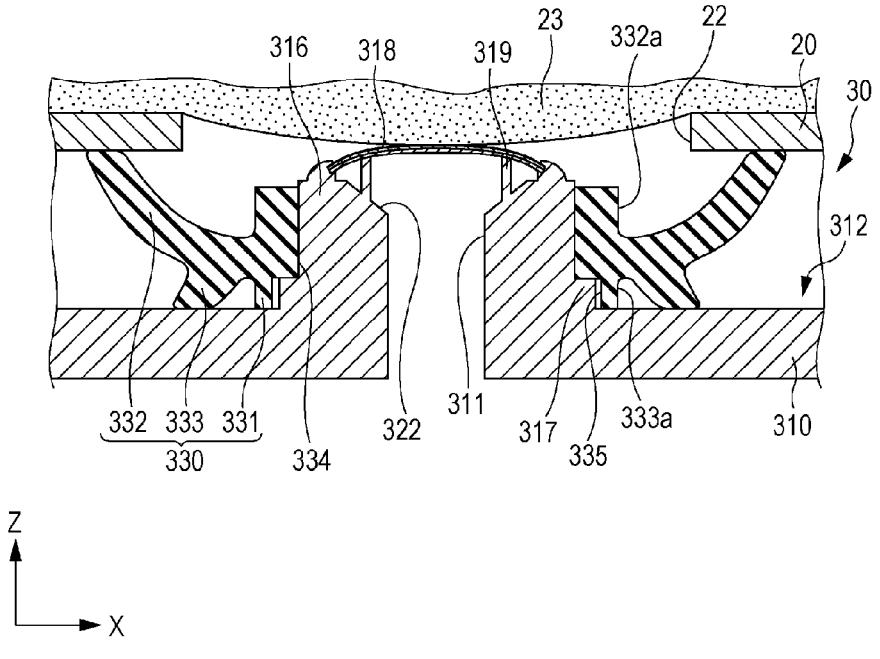


FIG. 1

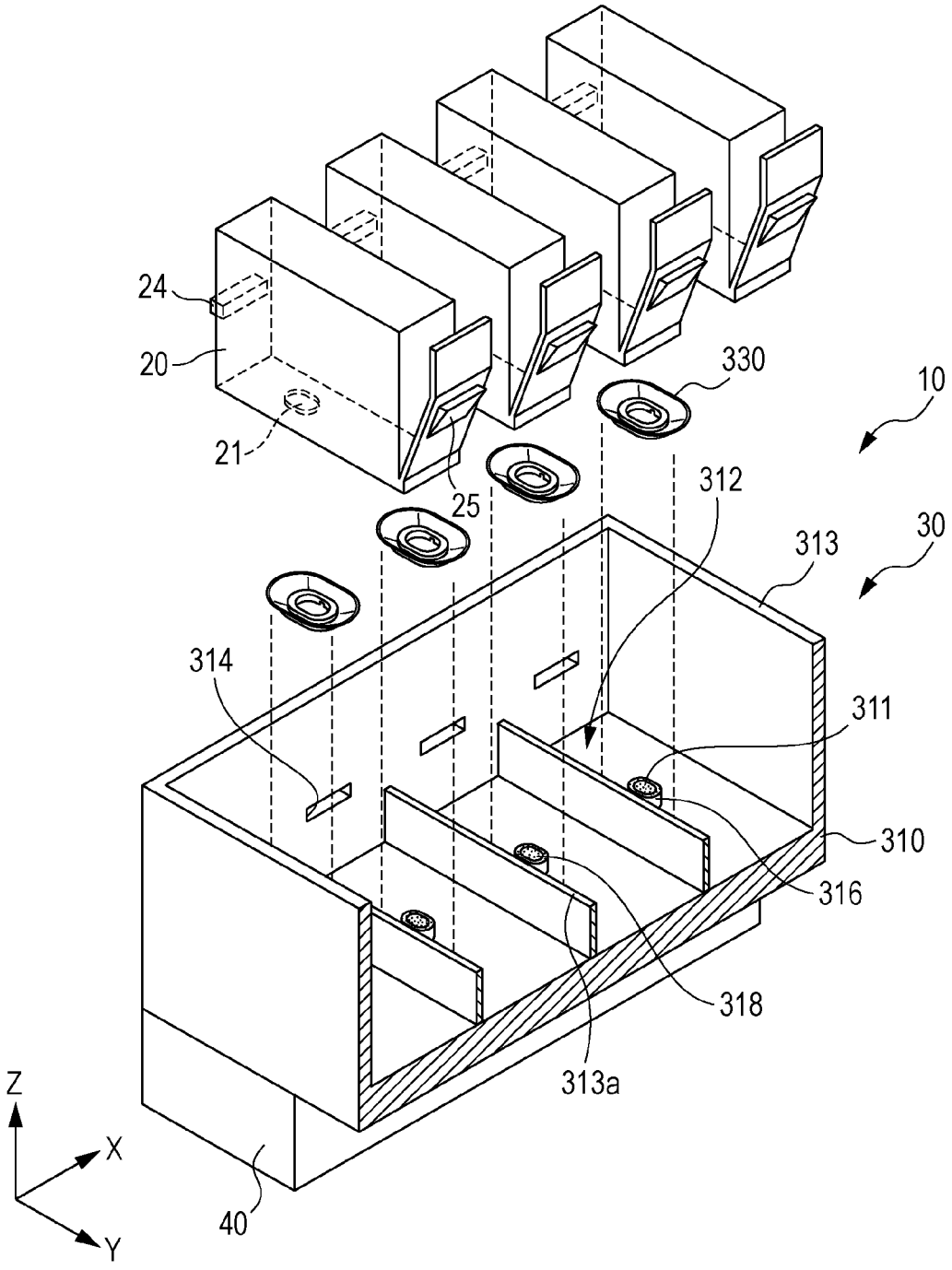


FIG. 2

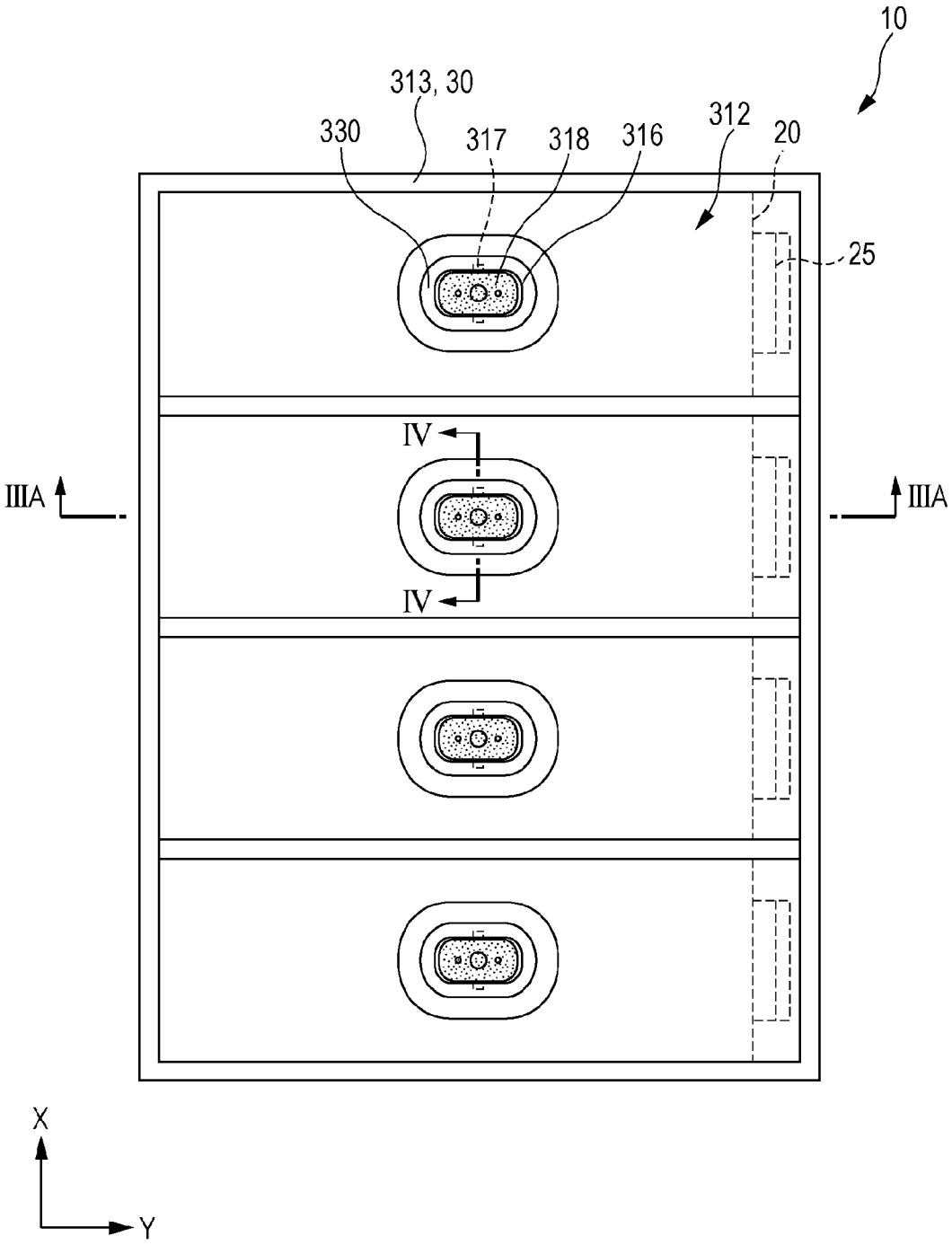


FIG. 3A

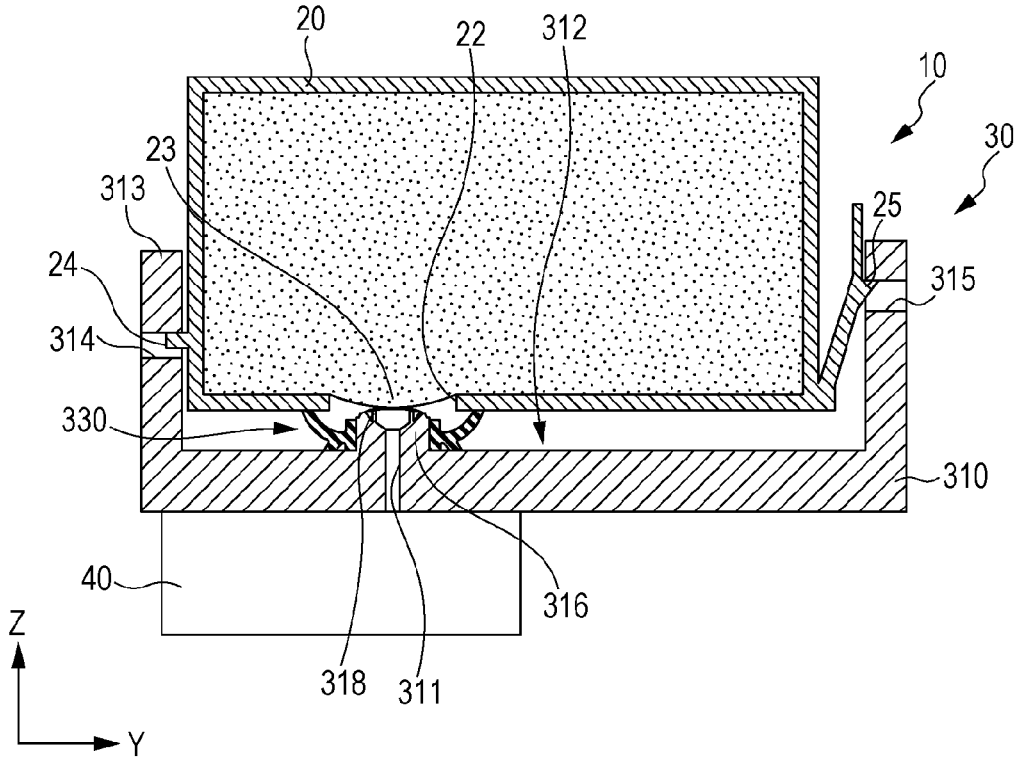

20
22
312
10
30
23
313
25
24
315
314
330
310
40
316
Z
318
311
Y

FIG. 3B

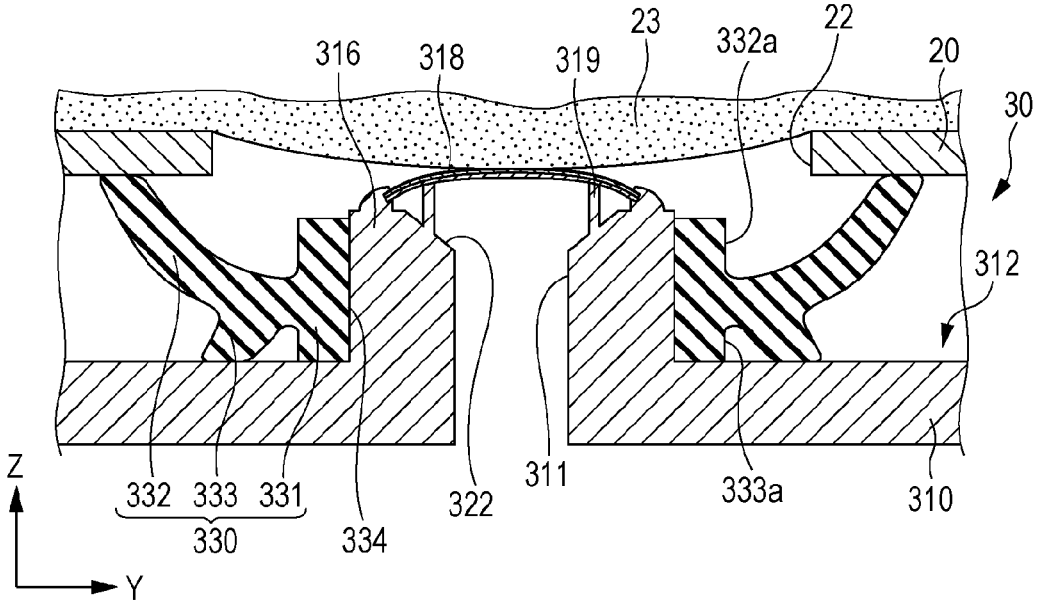

316
318
319
23
332a
22
20
30
312
Z
332
333
331
330
334
322
311
333a
310
Y

FIG. 4

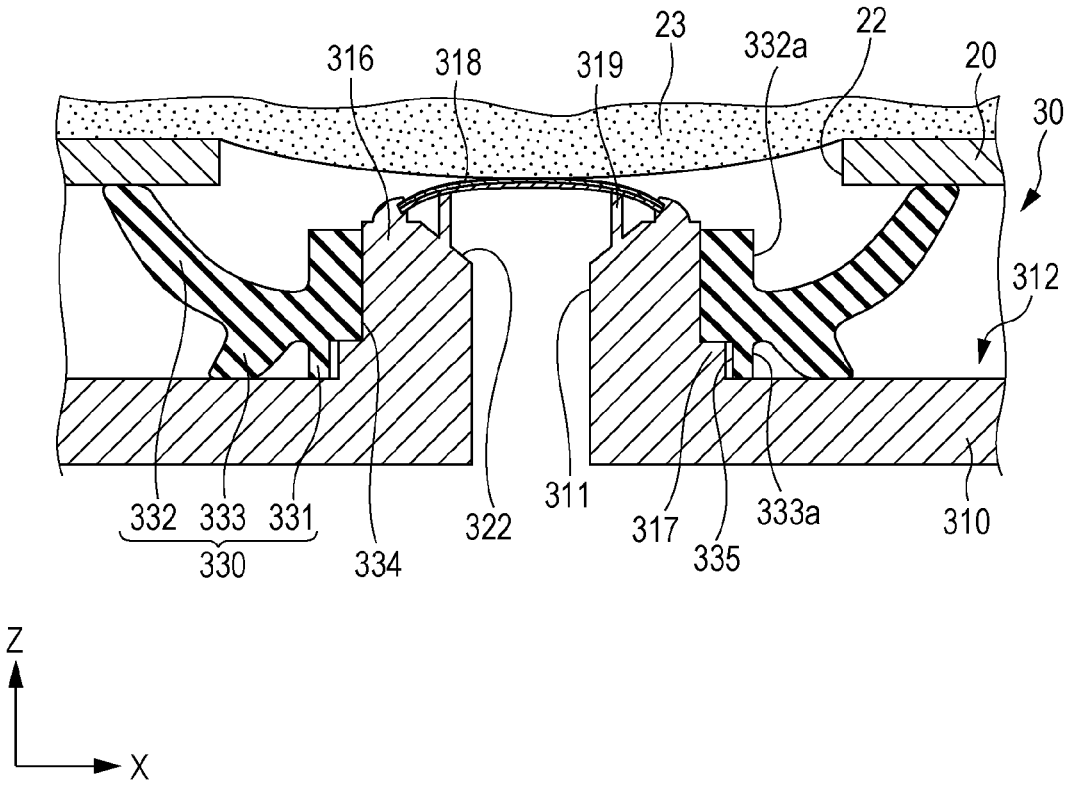

316
318
319
23
332a
22
20
30
312
332
333
331
330
334
322
311
317
335
333a
310
Z
X

FIG. 5A

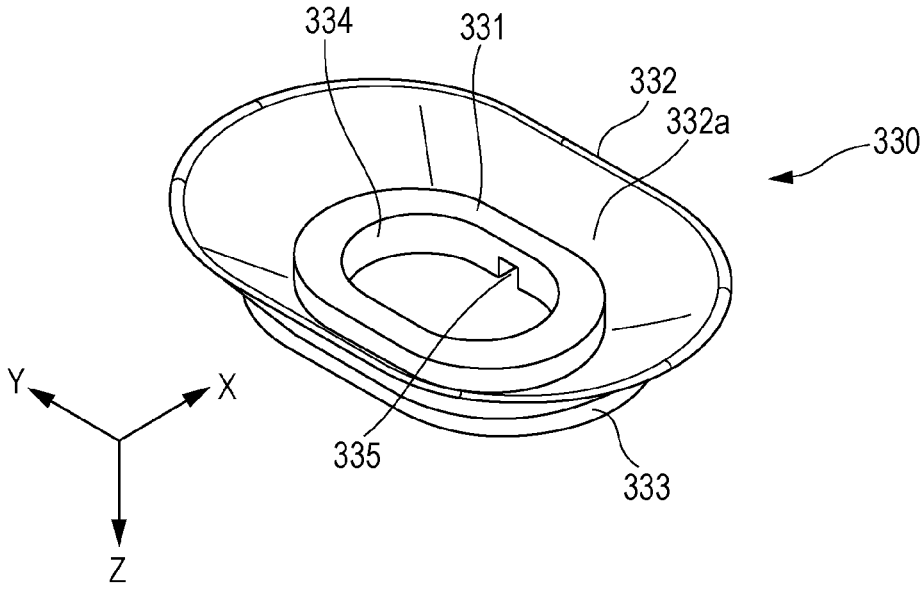

334
331
332
332a
330
335
333
Y
X
Z

FIG. 5B

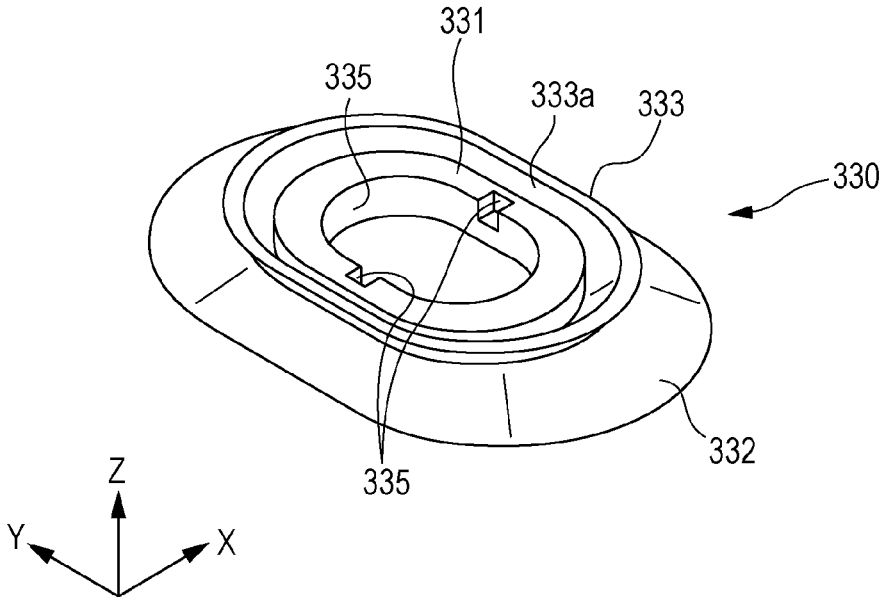

331
335
333a
333
330
332
335
Z
Y
X

FIG. 6A

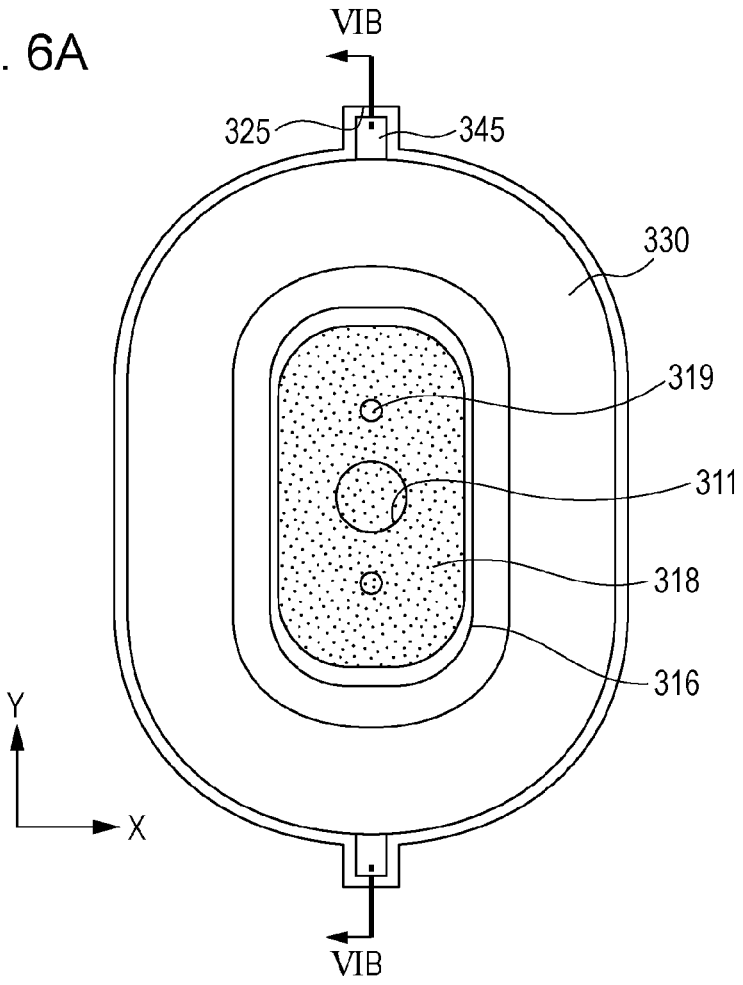

VIB
325
345
330
319
311
318
316
Y
X
VIB

FIG. 6B

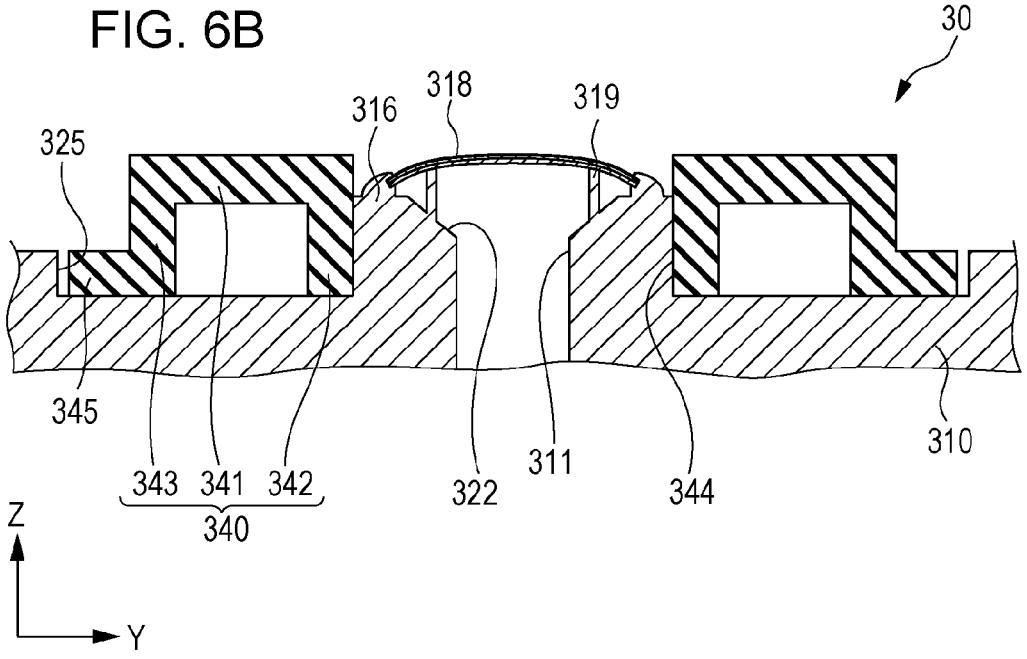

30
316
318
319
325
345
343
341
342
340
322
311
344
310
Z
Y

FIG. 7A

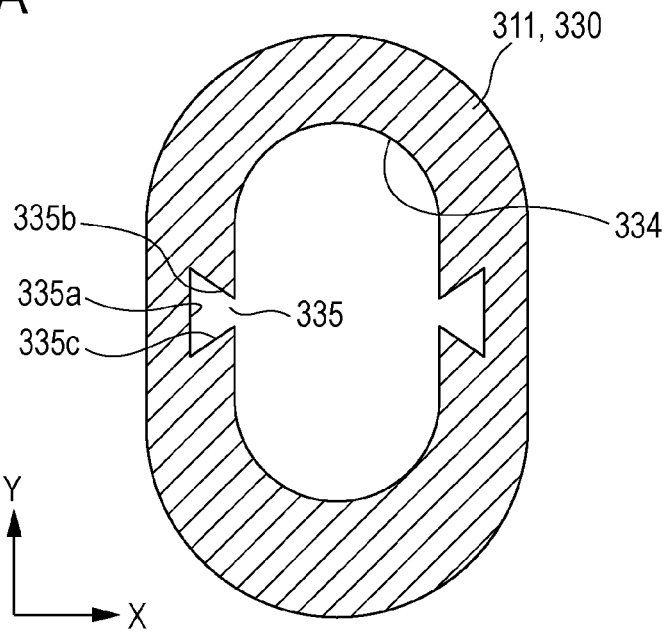

311, 330
334
335b
335a
335
335c
Y
X

FIG. 7B

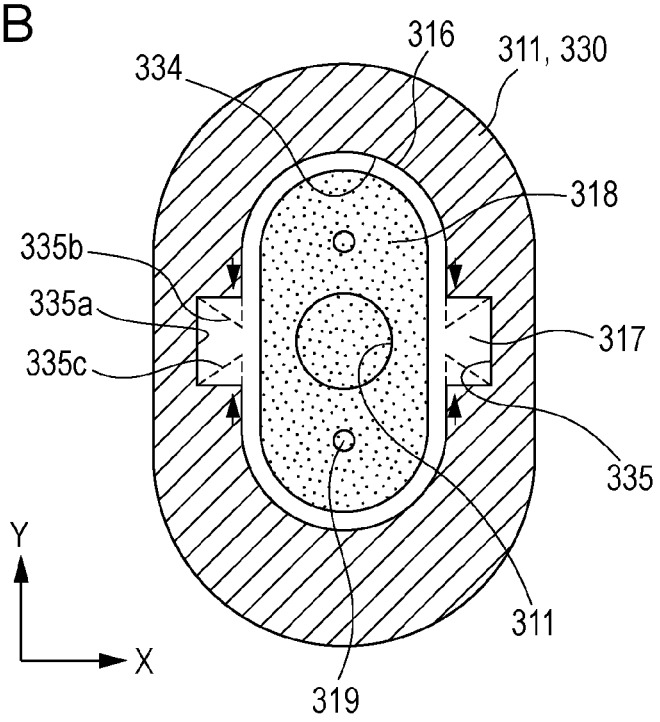

316
311, 330
334
318
335b
335a
317
335c
335
Y
311
X
319

FIG. 8

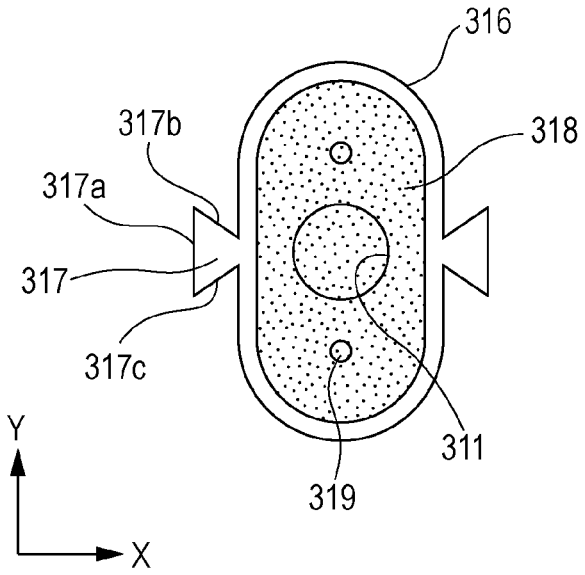

316
317b
318
317a
317
317c
311
319
Y
X

FIG. 9

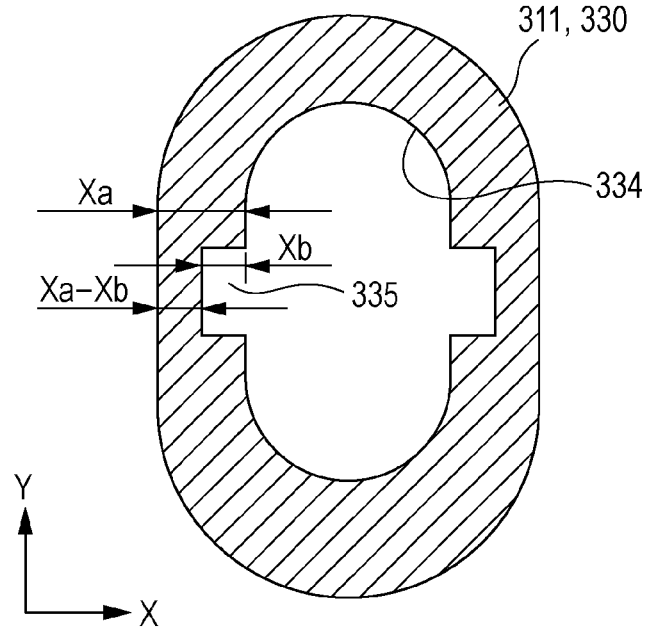

311, 330
334
Xa
Xb
Xa-Xb
335
Y
X

FIG. 10A

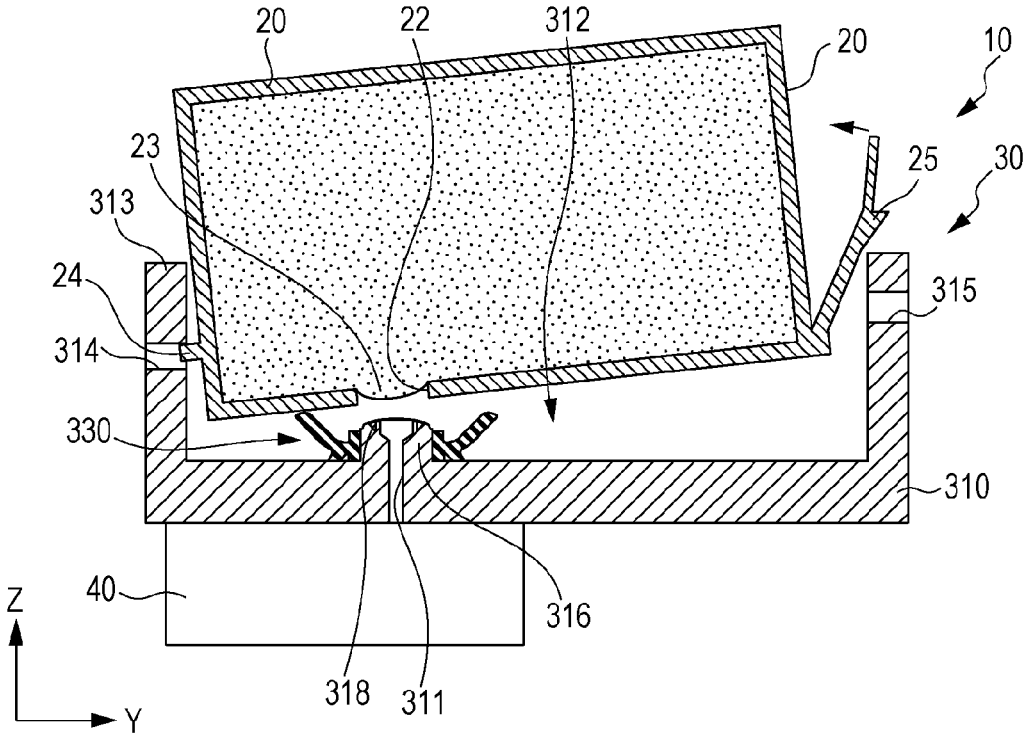


FIG. 10B

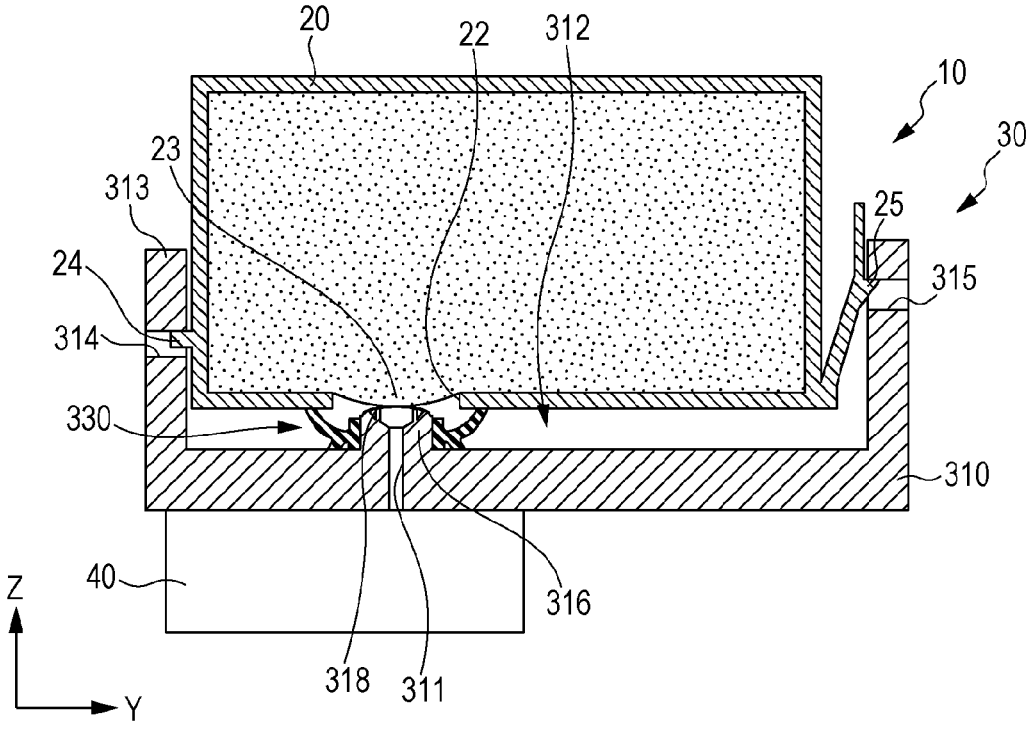
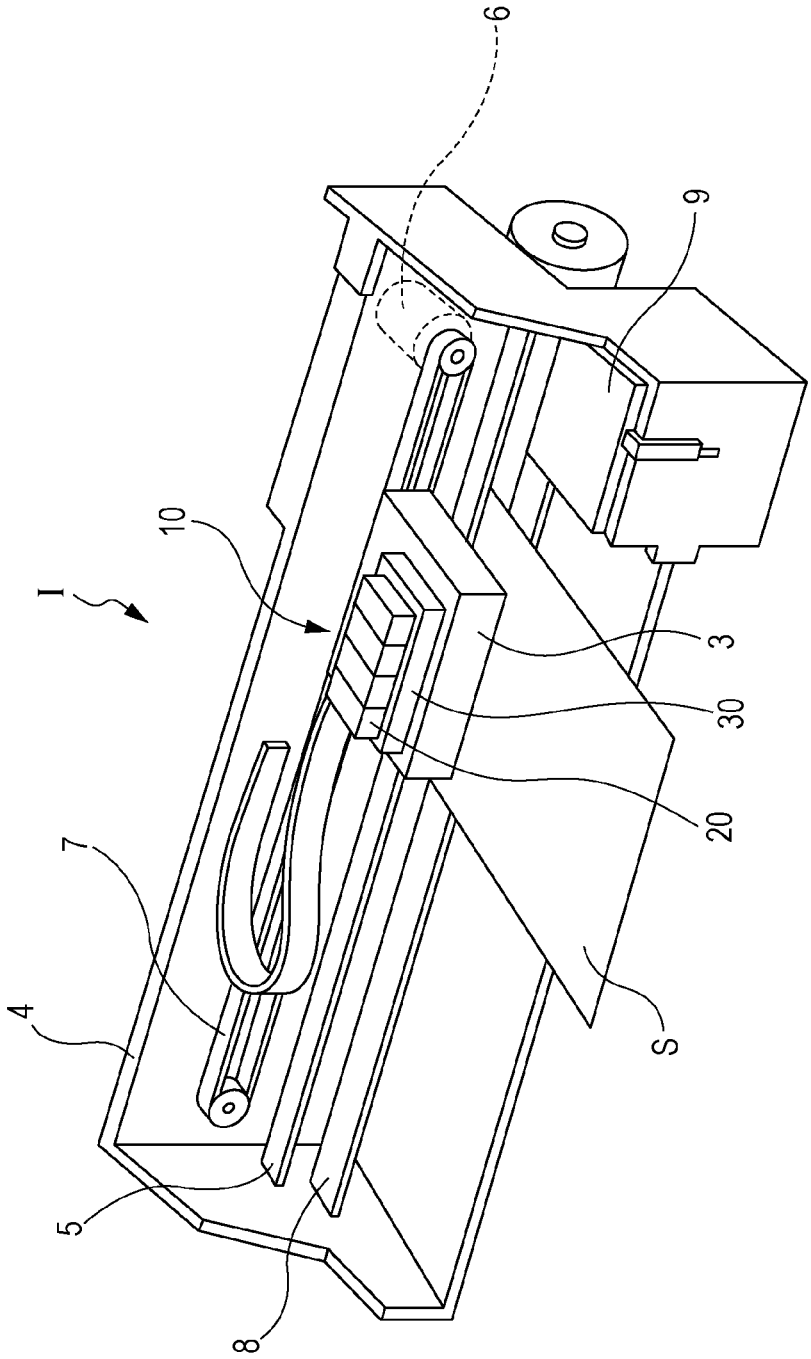


FIG. 11



FLOW PATH MEMBER, LIQUID EJECTING HEAD, AND LIQUID EJECTING APPARATUS

CROSS-REFERENCE TO RELATED APPLICATIONS

The present application claims priority to Japanese Patent Application No. 2014-128892 filed on Jun. 24, 2014, which is hereby incorporated by reference in its entirety.

BACKGROUND

1. Technical Field

The present invention relates to a flow path member that supplies liquid to a head main body ejecting the liquid, a liquid ejecting head that includes the flow path member, and a liquid ejecting apparatus that includes the liquid ejecting head.

2. Related Art

As a representative example of a liquid ejecting head that ejects liquid, there is an ink jet type recording head that ejects ink droplets. As the ink jet type recording head, there is proposed, for example, a recording head including a head main body that ejects ink droplets from a nozzle opening, and a flow path member in which the head main body is fixed, and a liquid storage unit such as an ink cartridge that stores ink therein is provided in a detachable manner, and which supplies the ink from the liquid storage unit to the head main body (for example, JP-A-2014-000717).

The flow path member includes an attaching portion of which a filter that is in a liquid-plane contact with the liquid storage unit is provided at a tip, and a sealing member that is provided around the attaching portion and seals the connection between the liquid storage unit and the filter.

However, if the sealing member rotates around the attaching portion and thus a positional deviation occurs, the sealing member cannot be uniformly deformed, and thus a deviation occurs in deformation of the sealing member. Therefore an adhesion defect occurs, and thus a problem of leakage of ink arises.

In addition, a liquid supplying unit is connected to the filter so that a contact area gradually increases from one side of the filter toward the other side in an in-plane direction. Therefore the outer shape of the attaching portion is made to have a so-called oval shape, in which a line connecting the one side and the other side is longer than a line orthogonal to the line connecting the one side and the other side, such as an ellipse, an oval, or an egg shape, so as to cause uniform stress to be applied thereto at the time of connection. In a case where the outer shape is other than the oval shape, that is, other than circular, the deviation of the deformation due to the positional deviation in a rotating direction easily occurs.

Further, similarly, such a problem exists not only in the ink jet type recording head but also in the flow path member used in the liquid ejecting head that ejects liquid other than ink.

SUMMARY

An advantage of some aspects of the invention is to provide a flow path member, a liquid ejecting head, and a liquid ejecting apparatus in which leakage of liquid due to an adhesion defect is suppressed.

According to a first aspect of the invention, there is provided a flow path member including a flow-path member main body provided with a liquid supplying path through which liquid is supplied to a head main body that ejects liquid and an attaching portion to which a liquid supplying unit that supplies liquid of the liquid supplying path is attached; and a sealing member provided with an insertion hole into which the attaching portion is inserted, and is interposed between the liquid supplying unit and the attaching portion, in which a convex portion is provided in any one of the inner surface of the insertion hole and the outer surface of the attaching portion, and a concave portion that fits with the convex portion is provided in the other of the inner surface of the insertion hole and the outer surface of the attaching portion.

In this aspect, the positioning of the sealing member with respect to the attaching portion can be performed by causing the convex portion to fit with the concave portion, it is possible to improve the assemblability, and it is possible to suppress a deformation defect due to a positional deviation of the sealing member with respect to the attaching portion. In addition, when a load is applied to the sealing member, such as a case of attachment of the liquid supplying unit, the movement of the sealing member in a rotating direction with respect to the attaching portion can be regulated by the fitting of the convex portion and the concave portion. Accordingly, it is possible to suppress a deformation defect due to a positional deviation of the sealing member. Further, by the fitting of the convex portion and the concave portion, it is possible to increase the contact area between the sealing member and the attaching portion and to improve adhesiveness by an anchor effect. Further, by providing the convex portion and the concave portion on the inner surface of the sealing member and the outer surface of the attaching portion, it is possible to decrease the size of the sealing member and the size of the flow path member compared to a case in which the convex portion is provided on the outer surface of the sealing member.

Here, the sealing member may include a base portion that is provided with the insertion hole, and a first lip that extends from the base portion to the liquid supplying unit to be in contact therewith. According to this, the base portion in which the concave portion is provided and the first lip that performs sealing by being in contact with the liquid supplying unit can be disposed apart from each other, and it is possible to suppress a deformation defect of the first lip by providing the concave portion.

Further, the sealing member may further include a second lip that is in contact with the flow-path member main body. According to this, the base portion in which the concave portion is provided and the second lip that performs sealing by being in contact with the flow-path member main body can be disposed apart from each other, and it is possible to suppress a deformation defect of the second lip by providing the concave portion.

In addition, the convex portion may be provided on the outer surface of the attaching portion, and the concave portion may be provided on the inner surface of the insertion hole. According to this, it is possible to achieve size reduction.

In addition, when the sealing member is viewed from a point of the liquid supplying path extending toward the liquid supplying unit, the outer shape of the sealing member may have a longitudinal direction and a short direction. According to this, when the liquid supplying unit is mounted along the longitudinal direction, since a load of the liquid supplying unit with respect to the sealing member is gradually increased, it is possible to suppress a deformation defect due to a drastic change of the load with respect to the sealing member.

In addition, each of angles formed by three surfaces of the concave portion corresponding to the convex portion may be an acute angle. According to this, when the convex portion fits with the concave portion, in addition to a force of the concave portion for interposing the convex portion, the engagement of the concave portion and convex portion is further strengthened, and therefore it is possible to suppress a positional deviation in the rotating direction.

Further, according to a second aspect of the invention, there is provided a liquid ejecting head including the flow path member of the first aspect.

In this aspect, a liquid ejecting head in which the leakage of liquid is suppressed, and thus the reliability is enhanced can be implemented.

Further, according to a third aspect of the invention, there is provided a liquid ejecting apparatus including the flow path member of the first aspect or the liquid ejecting head of the second aspect.

In this aspect, a liquid ejecting apparatus in which the leakage of liquid is suppressed, and thus the reliability is enhanced can be implemented.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be described with reference to the accompanying drawings, wherein like numbers reference like elements.

FIG. **1** is an exploded perspective view of a recording head according to a first embodiment.

FIG. **2** is a plane view of the recording head according to the first embodiment.

FIGS. **3**A and **3**B are cross-sectional views of the recording head according to the first embodiment.

FIG. **4** is a cross-sectional view of the recording head according to the first embodiment.

FIGS. **5**A and **5**B are perspective views of a sealing member according to the first embodiment.

FIGS. **6**A and **6**B are a plane view and a cross-sectional view of main portions of a recording head according to a comparative example.

FIGS. **7**A and **7**B are cross-sectional views illustrating a modification example of the sealing member according to the first embodiment.

FIG. **8** is a plane view illustrating a modification example of a convex portion according to the first embodiment.

FIG. **9** is a cross-sectional view illustrating the sealing member according to the first embodiment.

FIGS. **10**A and **10**B are cross-sectional views illustrating a method of mounting an ink cartridge to a flow path member.

FIG. **11** is a schematic view of a recording apparatus according to an embodiment of the invention.

DESCRIPTION OF EXEMPLARY EMBODIMENTS

Hereinafter, embodiments of the invention will be described in detail.

First Embodiment

FIG. **1** is an exploded perspective view of an ink jet type recording head as a liquid ejecting head according to a first embodiment of the invention, FIG. **2** is a plane view of the ink jet type recording head, FIGS. **3**A and **3**B are cross-sectional views respectively taken along line IIIA-IIIA and line IIIB-IIIB of FIG. **2**, and FIG. **4** is a cross-sectional view taken along line IV-IV of FIG. **2**.

As illustrated in the drawings, an ink jet type recording head **10** of the embodiment includes a flow path member **30**, to which an ink cartridge **20** is detachably provided as a liquid supplying unit for storing ink as liquid, and a head main body **40** that is fixed to the flow path member **30**.

The flow path member **30** includes a flow-path member main body **310**, and a sealing member **330** that is provided on the flow-path member main body **310**.

The flow-path member main body **310** is provided with a liquid supplying path **311**, the inside of which ink as liquid passes through, and a cartridge mounting portion **312**, on one surface of which the ink cartridge **20** is mounted, where the liquid supplying path **311** is opened. In the embodiment, four ink cartridges **20** are mounted on the cartridge mounting portion **312**. Further, in the embodiment, a parallel-arranging direction of the ink cartridges **20** mounted on the cartridge mounting portion **312** of the flow-path member main body **310** is referred to as a first direction X.

The cartridge mounting portion **312** is surrounded by wall portions **313**, and first engaging holes **314** and second engaging holes **315** that penetrate the wall portion in a thickness direction are provided on a pair of wall portions **313** that face each other, among the wall portions **313**. The first engaging holes **314** and the second engaging holes **315** of the embodiment are provided on the wall portions **313** that face each other in a second direction Y orthogonal to the first direction X.

The ink cartridge **20** is fixed to the cartridge mounting portion **312** by engaging a first claw **24** and a second claw **25** (the details thereof will be described below) of the ink cartridge **20** with the first engaging hole **314** and the second engaging hole **315**.

In the embodiment, since four ink cartridges **20** are mounted on the cartridge mounting portion **312**, partition plates **313***a* are provided between the ink cartridges **20**. That is, three partition plates **313***a* are arranged in parallel in the first direction X, and an interval between the adjacent partition plates **313***a* in the first direction X and an interval between the partition plate **313***a* and the wall portion **313** are set to be an interval in which the ink cartridge **20** can be inserted.

An attaching portion **316** that cylindrically protrudes in a third direction Z orthogonal to the first direction X and the second direction Y is provided on the cartridge mounting portion **312** of the flow-path member main body **310**. In the embodiment, since four ink cartridges **20** are fixed to the cartridge mounting portion **312**, the attaching portions **316** are provided as the same number of the ink cartridges **20**, that is, four attaching portions **316** are provided. Since four ink cartridges **20** are arranged to be fixed to the cartridge mounting portion **312** in parallel in the first direction X, four attaching portions **316** are arranged in parallel in the first direction X. In the embodiment, four attaching portions **316** are arranged so that the positions in the second direction Y are the same, but it is not particularly limited thereto. Four attaching portions **316** may be arranged so that the positions in the second direction Y are different from each other. Accordingly, it is possible to achieve size reduction without a plurality of liquid supplying paths **311** interfering with each other.

When the attaching portion **316** is viewed from the third direction Z as a mounting direction of the ink cartridge **20** in a plan view, the outer shape thereof is a so-called rectangular shape with round corners in which both end portions in the longitudinal direction have a semicircle shape

with a rectangular shape as a base. Further, the shape of the attaching portion **316** is not limited to the rectangular shape with round corners and may be an ellipse shape or a shape similar to an ellipse shape, that is, an egg shape or an oval shape. In the embodiment, an ellipse shape, a rectangular shape with round corners similar to an ellipse shape, an egg shape, and an oval are referred to as an oval shape. The shape of the attaching portion **316** is not limited to the oval shape and may be a polygonal shape such as a rectangular shape. In any shape, when the attaching portion **316** is viewed from the third direction Z in a plan view, the outer shape preferably has a longitudinal direction and a short direction. Accordingly, the thickness of an insertion hole **334** of the sealing member **330**, which will be described below, is defined by the outer shape, and thus is approximately uniform so that the deviation of the deformation of the sealing member **330** can be suppressed. In the embodiment, the attaching portion **316** is arranged such that the longitudinal direction is the same as the direction of a line connecting the first engaging hole **314** and the second engaging hole **315**, that is, the second direction Y, and the short direction is the first direction X as the parallel-arranging direction of the attaching portion **316**.

A convex portion **317**, which is inserted in a concave portion **335** of sealing member **330** (which will be described below), is provided on the outer circumference of the attaching portion **316**. In the embodiment, the convex portion **317** which protrudes toward the first direction X is provided on each of both sides of the attaching portion **316** in the first direction X that is the short direction thereof. That is, two convex portions in total are provided on one attaching portion **316**. Further, in the embodiment, the protruding amount of the convex portion **317** from the bottom surface of the cartridge mounting portion **312** toward the third direction Z is smaller than the protruding amount of the attaching portion **316**. In the embodiment, two convex portions **317** in total are provided on both sides of the attaching portion **316** in the first direction X, but the number of convex portions **317** and the positions thereof are not limited thereto. For example, the convex portions **317** may be provided on both sides of the attaching portion **316** in the second direction Y. Further, four convex portions **317** in total may be provided by providing the convex portions on both sides of the attaching portion **316** in the first direction X and the second direction Y. However, when viewed from the third direction Z in a plan view, it is preferable for the attaching portion **316** including the convex portions **317** to be formed with linear symmetry so that a line along the first direction X, which is the short direction, passing through the center of the attaching portion **316** and a line along the second direction Y, which is the longitudinal direction, are regarded as symmetrical axes. Accordingly, when mounting the sealing member **330** on the outer circumference of the attaching portion **316**, the sealing member **330** may be attached by being rotated at 180 degrees, and thus the process of attaching the sealing member **330** can be simplified. In addition, for example, if only one convex portion **317** is provided on the attaching portion **316**, and only one concave portion **335** is provided on the sealing member **330**, only one attachment position of the sealing member **330** exists where the convex portion **317** and the concave portion **335** fit with each other. Accordingly, there is a problem in that the sealing member **330** may be attached to the attaching portion **316** in a wrong direction, and thus there is a concern that a sealing defect may occur by attachment in the wrong direction. Although the sealing member **330** can be attached by being rotated at 180 degrees even when only one convex portion **317** is provided on attaching portion **316** as long as two concave portions **335** are provided on the sealing member **330**, it is not preferable because the contact area is decreased due to the concave portion **335** which does not fit with the convex portion **317**, and there is an disadvantage in that ink is accumulated in the concave portion **335**.

In addition, it is preferable for the corner portion of the convex portion **317** in the third direction Z to be subjected to chamfering. In this manner, when mounting the sealing member **330** on the attaching portion **316**, the sealing member **330** is unlikely to be engaged with the corner portion, and thus it is possible to easily mount sealing member **330**. The chamfering is not limited to that of the corner portion of the convex portion **317**, and the end surface of the convex portion **317** in the third direction Z may be provided to be inclined toward the protruding direction in the first direction X.

In this manner, it is possible to suppress the increase in size of the cartridge mounting portion **312** in the second direction Y by providing the convex portions **317** on both sides of the attaching portion **316** in the first direction X, which is the short direction. In other words, if the convex portions **317** are provided on both sides of the attaching portion **316** in the second direction Y, which is the longitudinal direction, it is difficult to secure sufficient space between the attaching portion **316** and the wall portion **313** of the attaching portion **316**, and therefore there is a concern that it is necessary to increase the size of the cartridge mounting portion **312** in the second direction Y. In the embodiment, the interval between the adjacent attaching portions **316** in the first direction X can be sufficiently secured by providing the convex portions **317** on both sides of the attaching portion **316** in the first direction X, which is the short direction, and therefore the convex portions **317** of the adjacent attaching portions **316** do not interfere with each other. Accordingly, it is possible to suppress the increase in size in the first direction X.

The liquid supplying path **311**, which is opened on the tip surface of the attaching portion, is provided on the attaching portion **316** and a filter **318**, which covers the opening of the liquid supplying path **311**, is provided on the tip surface where the liquid supplying path **311** is opened.

The filter **318** is for removing foreign substances or bubbles contained in ink, which is liquid, and is provided with a plurality of micropores. As the filter **318**, for example, a sheet-shaped filter formed with a plurality of micropores by finely weaving or knitting fiber such as metal or resin, or a filter in which a plurality of micropores penetrate a plate-shaped member such as metal or resin may be used. Further, non-woven fabric may be used for the filter **318** and the material of the filter is not particularly limited. In addition, the filter **318** may be configured of a single layer or may be configured of a multilayer in which a plurality of layers are laminated.

The filter **318** is fixed to the tip surface of the attaching portion **316**, that is, an opening surface on which the liquid supplying path **311** is opened. The method of fixing the filter **318** to the attaching portion **316** is not particularly limited, and adhesion by adhesive or welding can be used. In the embodiment, the filter **318** is fixed to the attaching portion **316** by welding. In this manner, the micropores of the filter **318** are not filled with adhesive, and thus it is possible to suppress the reduction of an effective area of the filter **318** compared to a case of adhesion by adhesive. The filter **318** fixed to the attaching portion **316** is provided such that the center portion of the filter is gently curved to be a convex shape on the surface side opposite to the tip surface of the

attaching portion **316**. That is, the filter **318** is provided such that the peripheral portion thereof is fixed to the tip surface of the attaching portion **316** and the center portion thereof protrudes toward the ink cartridge **20**. In the embodiment, the attaching portion **316** is provided with projection portions **319** that protrude toward the filter **318**, and the peripheral portion of the filter **318** is welded to the attaching portion **316** in a state where the projection portions **319** are in contact with the filter **318**, thereby providing the filter **318** so that the center portion of the filter is deformed to be a convex shape. That is, the tip of the projection portion **319** is provided to protrude toward the ink cartridge **20** more than the tip surface of the attaching portion **316**. Two projection portions **319** in total are respectively provided on both sides of the attaching portion with the liquid supplying path **311** interposed therebetween. As long as the projection portion **319** causes the filter **318** to be deformed to be a convex shape, the number or the position of the projection portion is not particularly limited. Of course, the peripheral portion may be fixed to the attaching portion **316** by deforming the filter **318** to be a convex shape without providing the projection portion **319**. The filter **318** is provided such that the center portion is made to be a convex shape toward the ink cartridge **20**, and therefore it is possible to suppress the reduction of an effective area of the filter **318** by suppressing a bubble remaining between the filter **318** and a supplying portion **23** when the filter **318** is in a liquid-plane contact with the supplying portion **23** of the ink cartridge **20**.

The liquid supplying path **311** is provided with a buffer chamber **322** downstream from the filter **318**. The buffer chamber **322** has a wider opening than that of the liquid supplying path **311** on the side of the head main body **40**. In addition, the bottom surface of the buffer chamber **322**, that is, a surface opposite to the filter **318**, is formed to be a tapered surface so as to be gradually deeper toward the liquid supplying path **311**. The projection portion **319** described above is provided on the bottom surface of the buffer chamber **322**.

It is possible to suppress gelation or adhesion of ink, which results from the thickening of ink directly below the filter **318** by moisture evaporated from the filter **318**, by providing the buffer chamber **322** having a large volume on a portion downstream from the filter **318**. That is, if an ink amount stored in a portion downstream from the filter **318** is small, the ink stored in a portion downstream from the filter **318** is thickened in a short period of time by moisture evaporated from the filter **318**. In particular, in a case where pigment ink is used as ink, gelation or adhesion of the pigment ink occurs in a short period of time due to the thickening thereof. In the embodiment, since the ink amount stored in a portion downstream from the filter **318** can be increased by providing the buffer chamber **322** on a portion downstream from the filter **318**, even if moisture is evaporated via the filter **318**, it is possible to suppress the ink stored in a portion downstream from the filter **318** from thickening in a short of period of time, and thus it is possible to make a time until gelation or adhesion occurs longer.

The sealing member **330** is mounted on the outer circumference of the attaching portion **316** where the filter **318** is provided.

Here, the sealing member **330** will be described in detail with reference to FIGS. **5**A and **5**B. FIGS. **5**A and **5**B are perspective views illustrating the sealing member.

As illustrated in the drawings, the sealing member **330** is formed of an elastic material such as a rubber or an elastomer, and includes a base portion **331** having a cylindrical shape, and a first lip **332** and a second lip **333** that are continuously provided on the outer circumference side of the base portion **331** along a circumferential direction.

The base portion **331** has a cylindrical shape in which the insertion hole **334**, into the center of which the attaching portion **316** is inserted, is provided. The insertion hole **334** is formed so that the shape of the opening is substantially the same as the shape of the attaching portion **316**, that is, in the embodiment, a rectangular shape with round corners. The inner diameter of the insertion hole **334** is provided to be slightly smaller than the inner diameter of the attaching portion **316**. Accordingly, when the sealing member **330** is mounted on the outer circumference of the attaching portion **316**, the outer circumference of the attaching portion **316** closely adheres to the inner surface of the insertion hole **334**.

The first lip **332** is continuously provided on the outer circumference of the base portion **331** along the circumferential direction, and is provided such that the base end portion is integrally fixed to the outer circumference of the base portion **331** and the tip portion has an inner diameter larger than the outer diameter of the base portion **331** and protrudes toward the ink cartridge **20** in the third direction Z. Accordingly, a first groove **332***a* is provided between the tip portion of the first lip **332** on the side of the ink cartridge **20** and the tip portion of the base portion **331** on the side of the ink cartridge **20**. Further, in a state in which the ink cartridge **20** is not mounted, the tip portion of the first lip **332** is provided to protrude toward the ink cartridge **20** more than the end face of the base portion **331** on the side of the ink cartridge **20** in the third direction Z. In this manner, the first groove **332***a* is provided between the first lip **332** and the base portion **331**, and thus the tip portion of the first lip **332** becomes a free end.

When the ink cartridge **20** is mounted on the cartridge mounting portion **312**, the first lip **332** is in contact with a surface where a supplying port **22** of the ink cartridge **20** is provided, and therefore the sealing member **330** and the ink cartridge **20** are connected to each other in a sealed state. Further, when the ink cartridge **20** is mounted on the cartridge mounting portion **312**, the end face of the base portion **331** is not in contact with the ink cartridge **20**. Accordingly, by causing only the first lip **332** to be in contact with the ink cartridge **20**, a contact pressure between the first lip **332** and the ink cartridge **20** is increased, thereby enhancing the sealing force.

In the embodiment, when the sealing member **330** is viewed from a point of the liquid supplying path **311** extending to the ink cartridge **20**, that is, viewed from the third direction Z, which is a mounting direction of the ink cartridge **20**, in a plan view, the outer shape of the sealing member **330** preferably has a longitudinal direction and a short direction. In the embodiment, when the sealing member **330** is viewed in a plan view, the outer shape thereof is a so-called rectangular shape with round corners in which both end portions in the longitudinal direction have a semicircle shape with a rectangular shape as a base. Further, the outer shape of the sealing member **330** represents the outer shape of a portion effective for sealing when the sealing member is in contact with the ink cartridge **20**, and if the sealing member **330** includes the first lip **332** of the embodiment, the outer shape of the sealing member is the outer shape of the first lip **332**. In the embodiment, the outer shape of the base portion **331** is substantially the same as that of the first lip **332**, and the protruding amount of the first lip **332** from the base portion **331** is substantially the same along the circumferential direction. In this manner, the deviation of the deformation of the first lip **332** is suppressed, and thus it is possible to cause the sealing member

to be in close contact with the ink cartridge **20** uniformly along the circumferential direction. Further, the outer shape of the sealing member **330** is not limited to the rectangular shape with round corners and may be an ellipse shape or a shape similar to an ellipse shape, that is, an egg shape or an oval shape. In the embodiment, an ellipse shape, a rectangular shape with round corners similar to an ellipse shape, an egg shape, and an oval are referred to as an oval shape. The shape of the sealing member **330** is not limited to the oval shape and may be a polygonal shape such as a rectangular shape. In any shape, when the sealing member **330** is viewed from the third direction Z in a plan view, the outer shape thereof preferably has a longitudinal direction and a short direction.

The second lip **333** is continuously provided on the outer circumference of the base portion **331** along the circumferential direction, and is provided such that the base end portion is integrally fixed to the outer circumference of the base portion **331**, and the tip portion has an inner diameter larger than the outer diameter of the base portion **331** and protrudes toward the bottom surface of the cartridge mounting portion **312** in the third direction Z. Accordingly, a second groove **333***a* is provided between the tip portion of the second lip **333** on the side of the cartridge mounting portion **312** and the base portion **331**, and thus the tip portion of the second lip **333** becomes a free end.

Since the protruding tip portion of the second lip **333** is in contact with the bottom surface of the cartridge mounting portion **312**, the sealing member **330** and the flow-path member main body **310** are connected to each other in a sealed state. Further, in the embodiment, the sealing member **330** and the flow-path member main body **310** are sealed by the contact between the end face of the base portion **331** in the third direction Z and the bottom surface of the cartridge mounting portion **312**. That is, the sealing member **330** and the flow-path member main body **310** are doubly sealed at two regions of the base portion **331** and the second lip **333**. Accordingly, it is possible to suppress the leakage of ink by reliably performing the sealing between the sealing member **330** and the flow-path member main body **310**.

In the inner surface of the insertion hole **334** of the base portion **331** of the sealing member **330**, the concave portion **335** in which the convex portion **317** of the attaching portion **316** is inserted is provided. In the embodiment, since the convex portion **317** is provided on each of both sides of the attaching portion **316** in the first direction X, the concave portion **335** is provided on each of both sides of the insertion hole **334** in the first direction X. In the embodiment, the concave portion **335** is provided without passing through the base portion **331** in the first direction X as the thickness direction, that is, without passing through the second groove **333***a*. Accordingly, it is possible to perform the sealing at the region where the base portion **331** is in contact with the cartridge mounting portion **312**. Of course, the concave portion **335** may be provided to pass through the base portion **331** in the first direction X as the thickness direction. That is, the concave portion **335** is provided to pass through the base portion in the first direction X, and the sealing member **330** and the cartridge mounting portion **312** may be sealed by only the second lip **333**.

In the embodiment, the concave portion **335** is provided only in the base portion **331** on the side of the cartridge mounting portion **312** in the third direction Z such that the concave portion is opened to an end portion on the side of the cartridge mounting portion **312** and is not opened to an end portion on the side opposite to the cartridge mounting portion **312**. Therefore, although the details are described below, in the third direction Z, the inner surface of the insertion hole **334** of the base portion **331** closely adheres to the outer surface of the attaching portion **316** along the circumferential direction, on the end portion side opposite to the end portion where the concave portion **335** of the base portion **331** is provided. Accordingly, the sealing member **330** and flow-path member main body **310** are sealed by the inner surface of the insertion hole **334** of the base portion **331** and the outer surface of the attaching portion **316**. In this manner, in the embodiment, the sealing member **330** and the flow-path member main body **310** can be sealed at a region where the inner surface of the insertion hole **334** of the base portion **331** closely adheres to the outer surface of the attaching portion **316**; a region where the end portion of the sealing member **330** in the third direction Z closely adheres to the cartridge mounting portion **312**; and a region where the second lip **333** adheres to the cartridge mounting portion **312**. Thus, it is possible to suppress the leakage of ink by reliably performing the sealing between the sealing member **330** and the flow-path member main body **310**. Of course, the concave portion **335** may be continuously provided on the base portion **331** along the third direction Z, that is, may be provided to be opened to both of the end portions of the base portion **331** in the third direction Z.

The sealing member **330**, in which the concave portion **335** is provided, is press-fitted into the outer circumference of the attaching portion **316**. At this time, the convex portion **317** provided on the attaching portion **316** is inserted in the concave portion **335** provided on the sealing member **330**, and thus the position of the sealing member **330** in the rotating direction with respect to the attaching portion **316** is defined with reference to the attaching portion **316** as the center in the first direction X and the in-plane direction of the second direction Y. That is, since the concave portion of the sealing member **330** and the convex portion of the attaching portion **316** fit with each other to cause the sealing member **330** to be mounted on the outer circumference of the attaching portion **316**, it is possible to easily perform the positioning when the sealing member **330** is mounted on the attaching portion **316**. Accordingly, it is possible to simplify fitting work of the sealing member **330**. In a case where the convex portion **317** and the concave portion **335** are not provided on the attaching portion **316** and the sealing member **330**, since the sealing member **330** is formed of an elastic material, the sealing member is easily deviated. Further, it is difficult to determine whether the positioning of the sealing member **330** in the rotating direction with respect to the attaching portion **316** is performed with a high accuracy by only visually recognizing the position of the sealing member **330** in the rotating direction with respect to the attaching portion **316**. If the position of the sealing member **330** in the rotating direction with respect to the attaching portion **316** deviates, the deviation of the deformation of the sealing member **330** occurs when mounting the ink cartridge **20**, and therefore there is a concern that the sealing defect may occur and ink may leak. In the embodiment, the convex portion **317** of the attaching portion **316** is fitted in the concave portion **335** of the sealing member **330**, and therefore it is possible to perform the positioning of the sealing member **330** in the rotating direction with respect to the attaching portion **316** with high accuracy, without depending on visual recognition. Therefore it is possible to suppress the sealing defect or the leakage of ink due to the positional deviation of the sealing member **330** in the rotating direction with respect to the attaching portion **316**.

In addition, the sealing member **330** press-fitted into the outer circumference of the attaching portion **316** fits with the

convex portion **317** of the attaching portion **316**, and thus the movement in the rotating direction with respect to the attaching portion **316** is regulated. That is, the convex portion **317** is in contact with the wall surface of the concave portion **335**, and thus the movement of the sealing member **330** in the rotating direction with respect to the attaching portion **316** is regulated. In this manner, the movement of the sealing member **330** in the rotating direction with respect to the attaching portion **316** is regulated, and when the ink cartridge **20** is mounted on the cartridge mounting portion **312**, the deviation of deformation of the sealing member **330** is suppressed, thereby suppressing the leakage of ink due to the sealing defect of the sealing member **330**. In a case where the convex portion **317** and the concave portion **335** are not provided on the attaching portion **316** and the sealing member **330**, since the sealing member **330** is formed of an elastic material, the positional deviation in the rotating direction may occur due to an external force such as vibration or a load at the time of mounting the ink cartridge **20**. In the embodiment, since the positional deviation of the sealing member **330** in the rotating direction is suppressed even when an external force such as vibration or a load at the time of mounting the ink cartridge **20** is applied, it is possible to suppress the leakage of ink.

In addition, the concave portion **335** of the sealing member **330** is made to fit with the convex portion **317** of the attaching portion **316**, and thus the contact area between the attaching portion **316** and the sealing member **330** can be increased. Further, in addition to the increase of the contact area, since the convex portion **317** of the attaching portion **316** contacts the concave portion **335** of the sealing member **330** in a surface perpendicular to the circumferential direction of the outer circumference of the attaching portion **316**, it is possible to improve adhesiveness and fixing force by the anchor effect. Accordingly, it is possible to suppress the leakage of ink from a space between the sealing member **330** and the flow-path member main body **310**.

In the embodiment, the sealing member **330** is provided with the first lip **332**, and the tip portion of the first lip **332** is in contact with the ink cartridge **20**. Accordingly, the base portion **331** provided with the concave portion **335** and the tip portion of the first lip **332**, which is in contact with the ink cartridge **20**, are arranged by being separated from each other by the first groove **332***a*. Therefore, even if the base portion **331** is deviated to be deformed, the influence of providing the concave portion **335** on the first lip **332** is reduced by providing the concave portion **335** to the base portion **331**, and thus it is possible to reliably seal the first lip **332** and the ink cartridge **20**. In a case where the end face of the base portion **331** is in contact with the ink cartridge **20** without providing the first lip **332**, the load is not uniformly applied to the base portion **331** due to the providing of the concave portion **335** to the base portion **331**, and thus the deformation of the base portion may be deviated. Of course, the sealing member **330** may be configured to include only the base portion **331** or only the base portion **331** and the second lip **333** without being provided with the first lip **332**.

Similarly, in the embodiment, since the second lip **333** is provided, and thus the sealing member **330** and the flow-path member main body **310** are sealed by the second lip **333**, the second lip **333** allows the influence of the concave portion **335** provided in the base portion **331** to be reduced, and thus it is possible to reliably seal the second lip **333** and the flow-path member main body **310**. Of course, the sealing member **330** may be configured to include only the base portion **331** or only the base portion **331** and the first lip **332** without being provided with the second lip **333**.

In the embodiment, since the convex portion **317** and the concave portion **335** are respectively provided on the outer surface of the attaching portion **316** and the inner surface of the insertion hole **334** of the sealing member **330**, it is possible to obtain size reduction of the flow path member **30**, in particular, size reduction in the first direction X in which the convex portion **317** is provided by suppressing the size increase of the sealing member **330**.

In contrast, as illustrated in FIGS. **6**A and **6**B, for example, in a case where a convex portion **345** is provided on the outer circumference of a sealing member **340** and a concave portion **325**, with which the convex portion **345** fits, is provided on the flow-path member main body **310**, it is possible to suppress the positional deviation of the sealing member **340** in the rotating direction with respect to the attaching portion **316**, but the size of the sealing member **340** is increased in a direction, in which the convex portion **345** is provided, by the size of the convex portion **345**, and therefore the flow path member **30** is increased in size.

In the configuration illustrated in FIGS. **6**A and **6**B, the sealing member **340** includes a first sealing portion **341** having a flat plate shape, a cylindrical second sealing portion **342** that is opened in an oval, and a cylindrical third sealing portion **343** that is opened in an oval having an inner diameter larger than that of the second sealing portion **342**.

The second sealing portion **342** is provided with an insertion hole **344**, and has a cylindrical shape to fit with the periphery of the attaching portion **316**. In addition, the third sealing portion **343** has a cylindrical shape having an inner diameter larger than that of the second sealing portion **342**. The first sealing portion **341** is integrally connected to one end of the second sealing portion **342**. Further, the outer circumference of the first sealing portion **341** is integrally connected to one end of the third sealing portion **343**. That is, the sealing member **340** is a hollow member that is opened toward the flow-path member main body **310**, that is, has a cross-sectional shape of a character C.

Further, the convex portion **345** is provided on the outer circumference of the third sealing portion **343**. In the example illustrated in FIGS. **6**A and **6**B, the convex portion **345** is provided on each of both sides in the second direction Y.

In addition, the flow-path member main body **310** is provided with the concave portion **325** that fits with the convex portion **345** of the sealing member **340**, and the convex portion **345** of the sealing member **340** and the concave portion **325** fit with each other. Therefore the positioning of the sealing member **340** in the rotating direction with respect to the attaching portion **316** is performed.

Since the convex portion **345** is provided to protrude on the outer circumference of the sealing member **340**, the size of the sealing member **340** is increased in the second direction Y in which the convex portion **345** is provided. Since the convex portion **345** and the concave portion **325** are provided on the outer circumference of the sealing member **340**, it is difficult to improve adhesiveness because the contact area between the sealing member **340** and the attaching portion **316** is not increased and the anchor effect with respect to the attaching portion **316** cannot be obtained.

In the embodiment, the concave portion **335** is provided such that the angles formed by the three surfaces corresponding to the convex portion **317** are approximately 90 degrees, but the angles are not particularly limited. Here, the modification example of the concave portion **335** is illus-

trated in FIGS. **7**A and **7**B. FIGS. **7**A and **7**B are cross-sectional views illustrating a modification example of the sealing member.

As illustrated in FIG. **7**A, the concave portion **335** may be provided such that the angles formed by the three surfaces corresponding to the convex portion **317** are acute angles. Here, the three surfaces of the concave portion **335** corresponding to the convex portion **317** indicate a first surface **335***a* of the concave portion **335** in the first direction X, and a second surface **335***b* and a third surface **335***c* in the second direction Y. In addition, the angle formed by the first surface **335***a* and the second surface **335***b* is an acute angle, that is, an angle smaller than 90 degrees. Further, the angle formed by the first surface **335***a* and the third surface **335***c* is an acute angle, that is, an angle smaller than 90 degrees. Accordingly, the opening width of the concave portion **335** with respect to the insertion hole **334** is small.

In this manner, the angles formed by the first surface **335***a*, and the second surface **335***b* and the third surface **335***c* of the concave portion **335** are acute angles, and therefore, as illustrated in FIG. **7**B, when the concave portion **335** and the convex portion **317** fit with each other, the concave portion **335** can apply a force for interposing the convex portion **317** from both of the sides of the second direction Y, thereby effectively regulating the movement in the rotating direction. That is, it is preferable that the opening width of the concave portion **335** with respect to the insertion hole **334** is smaller than the opening width of the convex portion **317**. In this manner, when the convex portion **317** and the concave portion **335** fit with each other, it is easy for the convex portion **317** to be press-fitted to the concave portion **335**, and in the opening portion of the concave portion **335** with respect to the insertion hole **334**, the concave portion **335** can apply a force for interposing the convex portion **317**, thereby effectively regulating the movement in the rotating direction.

Further, the angles formed by the first surface **335***a*, and the second surface **335***b* and the third surface **335***c* of the concave portion **335** are right angles, and the opening width w**1** of the concave portion **335** is smaller than the opening width w**2** of the convex portion **317**. Therefore the concave portion **335** can apply a force for interposing the convex portion **317** from both of the sides of the second direction Y; however, the contact areas between the two surfaces **335***b* and **335***c* and the convex portion **317** are increased, and thus it is difficult to perform the press-fitting due to friction. In addition, the angles formed by the first surface **335***a*, and the second surface **335***b* and the third surface **335***c* of the concave portion **335** may be obtuse angles, but the force of the concave portion **335** for interposing the convex portion **317** is reduced. Further, in the embodiment, the angles formed by the three surfaces of the convex portion **317** corresponding to the concave portion **335** are right angles; however, the angles are not limited thereto and, for example, the surface of the convex portion **317** may be provided to be inclined with respect to the second surface **335***b* and the third surface **335***c* of the concave portion **335**. That is, as illustrated in FIG. **8**, angles formed by three surfaces of the convex portion **317**, that is, angles formed by a fourth surface **317***a* in the first direction X, and a fifth surface **317***b* and a sixth surface **317***c* that are two surfaces in both sides of the second direction Y with respect to the fourth surface **317***a*, are set to be larger than 270 degrees, and thus the corner portions of the convex portion **317** may be sharpened to have acute angles. In this case, as illustrated in FIGS. **7**A and **7**B, even if the angles formed by the first surface **335***a*, and the second surface **335***b* and the third surface **335***c* of the concave portion **335** may be right angles or acute angles, when the convex portion **317** and the concave portion **335** fit with each other, it is easy for the convex portion **317** to be press-fitted to the concave portion **335**, and the concave portion **335** can apply a force for interposing the convex portion **317**, thereby effectively regulating the movement in the rotating direction.

In addition, as illustrated in FIG. **9**, in the sealing member **330**, it is assumed that the width of the portion in which the concave portion **335** is not provided is Xa, the depth of the concave portion **335** in the first direction X is Xb, and the width of the portion in which the concave portion **335** is provided is Xa−Xb. In this case, it is preferable that the ratio (Xb/Xa) of concavity of the concave portion **335** is in a range of 0.35 or more and 0.55 or less. In addition, if the ratio (Xb/Xa) of concavity of the concave portion **335** is too small, an engaging effect of the concave portion **335** with respect to the convex portion **317** is decreased. Further, if the ratio (Xb/Xa) of concavity of the concave portion **335** is too large, the sealing member **350** becomes thin, and is extended when being press-fitted in the attaching portion **316**. Therefore there is a concern that the sealing member **350** may be broken, and there is also a concern that the sealing member **350** may be deformed to be distorted by being extremely extended, thereby causing a press-fitting failure. That is, by causing the ratio (Xb/Xa) of concavity of the concave portion **335** to be in a range of 0.35 or more and 0.55 or less, the engaging effect of the concave portion **335** with respect to the convex portion **317** can be improved, and it is possible to suppress the press-fitting failure by suppressing the deformation of the sealing member when the sealing member is press-fitted in the attaching portion **316**. The width Xb of the sealing member **330** indicates the width of a portion that is affected when the sealing member is press-fitted in the attaching portion **316**, and, in the embodiment, is the thickness when the base portion **331** is viewed from the third direction Z in a plan view.

Here, the ink cartridge **20** detachably mounted to the flow path member **30** will be described with reference to FIGS. **1** and **2**.

The ink cartridge **20** has a hollow box shape in which ink (liquid) is stored. Further, a supplying port that requests ink in the ink cartridge **20** to the flow path member **30** is provided on the bottom surface of the ink cartridge **20**. In the supplying port **22**, the supplying portion **23** is provided as an ink absorber. The supplying portion **23** is in press contact with the filter **318** of the flow path member **30**, and is for supplying ink in the ink cartridge **20** to the liquid supplying path **311** of the flow path member **30**. As the supplying portion **23**, for example, a non-woven fabric and a porous material such as cotton-like pulp, superabsorbent polymer, or urethane foam may be used.

The ink cartridge **20** includes a first engaging claw **24** that is inserted into the first engaging hole **314** provided in the wall portion **313** of the flow-path member main body **310** and a second engaging claw **25** that is provided on a surface opposite to the first engaging claw **24** and is inserted into the second engaging hole **315** provided in the wall portion **313** of the flow-path member main body **310**. That is, the first engaging claw **24** and the second engaging claw **25** are respectively provided on both of the surfaces of the ink cartridge **20** in the second direction Y.

The second engaging claw **25** is integrally formed on the ink cartridge **20** such that one end portion is fixed to the side surface of the ink cartridge **20** on the side of the supplying portion **23** and the other end portion becomes a free end.

Accordingly, the second engaging claw **25** is capable of being elastically deformed toward the side surface of the ink cartridge **20**.

A method of mounting the ink cartridge **20** to the flow path member **30** will be described with reference to FIGS. **10**A and **10**B. FIGS. **10**A and **10**B are cross-sectional views illustrating a method of mounting an ink cartridge according to the first embodiment of the invention to a flow path member.

As illustrated in FIG. **10**A, firstly, the first engaging claw **24** provided on one surface of the ink cartridge **20** in the second direction Y is obliquely inserted inside the wall portion **313** of the flow-path member main body **310** and then the first engaging claw **24** is inserted into the first engaging hole **314**.

As illustrated in FIG. **10**B, in a state in which the first engaging claw **24** of the ink cartridge **20** is inserted into the first engaging hole **314**, the ink cartridge **20** is rotated with the first engaging claw **24** as a fulcrum, and thus the ink cartridge **20** is inserted inside the wall portion **313**. At this time, since the second engaging claw **25** is elastically deformed by being pressed by the wall portion **313** of the flow-path member main body **310**, the second engaging claw does not inhibit the ink cartridge **20** from being inserted inside the wall portion **313**. Accordingly, the supplying portion **23** and the filter **318** are connected.

The supplying portion **23** is gradually in contact with the filter **318** to be connected by attaching the ink cartridge **20** to flow path member **30** in this manner. At this time, the contact area between the ink cartridge **20** and the sealing member **330** is gradually increased by rotating the ink cartridge in a plane including the second direction Y and the third direction Z, and therefore the load of ink cartridge **20** with respect to the sealing member **330** is gradually increased. However, since the sealing member **330** has an outer shape having a longitudinal direction in the second direction Y, it is possible to suppress the load with respect to the sealing member **330** according to the rotation of the ink cartridge **20** from drastically increasing. That is, if the sealing member **330** has a shape of a perfect circle or is disposed to have an outer shape having a short direction in the second direction Y, the contact area according to the rotation of the ink cartridge **20** is drastically increased, and thus the load thereof is drastically changed. Therefore there is a concern that the deviation of deformation or the positional deviation of the sealing member may occur according to the drastic change of the load.

In the embodiment, by causing the sealing member **330** to have an outer shape having a longitudinal direction in the second direction Y, as the direction in which the area is increased according to the rotation of the ink cartridge **20**, it is possible to suppress the load with respect to the sealing member **330** according to the rotation of the ink cartridge **20** from drastically increasing, and to suppress the deviation of deformation or the positional deviation of the sealing member **330** according to the drastic change of the load. Accordingly, it is possible to suppress the sealing defect of the sealing member **330**, and to suppress the leakage of ink.

The head main body **40** is fixed to a surface of the flow path member **30** opposite to the cartridge mounting portion **312**.

The head main body **40** is provided with a liquid ejecting surface, in which a nozzle for ejecting an ink droplet as liquid is opened, on the side opposite to the surface to which the flow path member **30** is fixed. In addition, the inside (not illustrated) of the head main body **40** is configured by a liquid flow path that communicates with the nozzle and the flow path of the flow path member **30**, and a pressure generating unit that causes the pressure of the ink in the liquid flow path to be changed. As the pressure generating unit, for example, a unit which changes the volume of the liquid flow path according to the deformation of a piezoelectric actuator having a piezoelectric material exhibiting an electromechanical converting function and causes the pressure of ink in the liquid flow path to be changed, thereby ejecting ink droplets from a nozzle; a unit in which a heating element is disposed in the liquid flow path and which ejects ink droplets from a nozzle by bubbles generated by the heat of the heating element; and a so-called electrostatic actuator that causes electrostatic force to be generated between a vibration plate and an electrode and causes the vibration plate to be deformed by the electrostatic force, thereby ejecting ink droplets from a nozzle, may be used.

In the ink jet type recording head **10**, ink is supplied from the ink cartridge **20** to the head main body **40** through the flow path member **30**, and ink droplets are ejected from a nozzle by causing the pressure generating unit to change the pressure of ink in the liquid flow path.

Another Embodiment

Hereinbefore, an embodiment of the invention has been described, but the specific configuration of the invention is not limited to the embodiment described above.

For example, in the first embodiment described above, the convex portion **317** is provided on the outer circumference of the attaching portion **316** and the concave portion **335** is provided on the inner circumferential surface of the insertion hole **334** of the sealing member **330**. However, the invention is not particularly limited thereto, and thus a concave portion may be provided on the outer circumference of the attaching portion **316** and a convex portion may be provided on the inner circumferential surface of the insertion hole **334** of the sealing member **330**. In order to provide a concave portion on the outer circumference of the attaching portion **316**, a thickness for the concave portion to be formed is required to the attaching portion **316**, and when the sealing member **330** is mounted on the outer circumference of the attaching portion **316**, the convex portion of the sealing member **330** may interfere with the press-fitting. Accordingly, as in the first embodiment described above, by providing the concave portion **335** on the inner circumferential surface of the insertion hole **334** of the sealing member **330** and providing the convex portion **317** on the outer surface of the attaching portion **316**, it is possible to decrease the size of the attaching portion **316**, and to improve workability when the sealing member **330** is press-fitted to the attaching portion **316**.

In the first embodiment, a configuration in which the attaching portions **316** are arranged in parallel with each other in the first direction X is exemplified, but the invention is not limited thereto. The attaching portions **316** may be arranged in parallel with each other in the second direction Y, or the parallel arrangements in the first direction X and the second direction Y may be mixed. A plurality of the attaching portions **316** may have different sizes, and according to the sizes, the sealing members **330** may have different sizes. Of course, the number of attaching portions **316** is not limited to the number in the first embodiment, and one flow path member **30** may be provided with a plurality of (two or more) attaching portions **316**, or one flow path member **30** may be provided with one attaching portion **316**.

In the first embodiment, as the sealing member **330**, a sealing member that includes the base portion **331**, the first

lip **332**, and the second lip **333** is exemplified, but the sealing member is not limited thereto. For example, as the sealing member **340** of the comparative example in the first embodiment, a sealing member that includes the first sealing portion **341**, the second sealing portion **342**, and the third sealing portion **343** may be used. Even in a case of using the sealing member **340**, similar to the first embodiment, by providing a convex portion to one of the sealing member **340** and the attaching portion **316** and providing a concave portion to the other one, it is possible to obtain the same effects as the first embodiment. Further, the sealing member is not limited to the sealing members **330** and **340**, and may be a so-called O-ring of which the cross section is a circle, or a solid member or a hollow member having a polygonal shape of which the cross section is a rectangular shape. As described above, it is preferable that the ratio (Xb/Xa) of concavity of the concave portion is in the range of 0.35 or more and 0.55 or less, the width Xa of the sealing member in which the concave portion is not provided, which is regarded as a basis, indicates the width of a portion that is affected when the sealing member is press-fitted in the attaching portion **316**, and, in the case of the sealing member **340**, the width Xa is the thickness when the second sealing portion **342** is viewed from the third direction Z in a plan view. In addition, if the sealing member is a solid member, the thickness Xa is a thickness (thickness in a direction in which a concave portion is provided) when the solid member is viewed from the third direction Z in a plan view.

In the first embodiment, a configuration is exemplified in which the outer shape of the attaching portion **316** is an oval shape when the attaching portion is viewed from the third direction Z in a plan view, but the invention is not limited thereto. For example, the outer shape of the attaching portion **316** may be a perfect circle or a polygonal shape. Of course, the opening shape of the insertion hole **334** of the sealing member **330** is not particularly limited and may be a perfect circle or a polygonal shape. In addition, the opening shape of the insertion hole **334** of the sealing member **330** may not be a shape similar to the outer shape of the attaching portion **316**. That is, it is not limited to an aspect in which the inner surface of the insertion hole **334** of the sealing member **330** and the outer surface of the attaching portion **316** adhere to each other along the circumferential direction, and for example, a gap between the insertion hole **334** and the attaching portion **316** may be formed along a part of or the entirety of the circumferential direction. In this manner, even if a gap is formed between the insertion hole **334** and the attaching portion **316**, by providing the convex portion **317** and the concave portion **335**, it is possible to regulate the movement of the sealing member **330** in the rotating direction with the attaching portion **316** as a center. In other words, since the positioning of the sealing member **330** in the rotating direction with respect to the attaching portion **316** is performed by providing the convex portion **317** and the concave portion **335** and the movement in the rotating direction is regulated, it is possible to adopt a configuration in which a gap is provided between the sealing member **330** and the attaching portion **316**.

In addition, in the first embodiment, a configuration in which the sealing member **330** has a longitudinal direction and a short direction is exemplified, but the invention is not limited thereto. The outer shape of the sealing member **330** may be a perfect circle or a square.

Further, in the ink jet type recording head **10** of the first embodiment, a part of an ink jet type recording head unit that includes an ink flow path communicating with an ink cartridge or the like is configured to be mounted in an ink jet type recording apparatus. FIG. **11** is a schematic view illustrating an example of the ink jet type recording apparatus.

In an ink jet type recording apparatus I illustrated in FIG. **11**, the ink jet type recording head **10** is detachably provided with the ink cartridge **20** configuring an ink supplying unit, and a carriage **3**, on which the ink jet type recording head **10** is mounted, is provided to a carriage shaft **5** attached to an apparatus main body **4** to be movable in the axial direction. The ink jet type recording head **10** ejects a black ink composition and a color ink composition.

Further, the carriage **3** on which the ink jet type recording head **10** is mounted is moved along the carriage shaft **5** by transferring driving force of a driving motor **6** to the carriage **3** via a plurality of gears (not illustrated) and a timing belt **7**. Meanwhile, the apparatus main body **4** is provided with a transporting roller **8** as a transporting unit, and a recording sheet S as a recording medium such as paper is transported by the transporting roller **8**. A transporting unit that transports the recording sheet S is not limited to the transporting roller and may be a belt or a drum.

In the example described above, the ink jet type recording head **10** including the flow path member **30** has been described, but the invention can be applied to an ink jet type recording apparatus in which the flow path member **30** is provided to a portion other than the ink jet type recording head **10**. Specifically, in an ink jet type recording apparatus in which an ink tank as a liquid supplying unit in which ink is stored is fixed to the apparatus main body **4** instead of being mounted on the carriage **3**, and the ink tank and the head main body **40** are connected via a supplying tube having a tube shape, for example, the flow path member **30** may be provided to a location where the ink tank is installed.

In the ink jet type recording apparatus I, a configuration in which the ink jet type recording head **10** is mounted on the carriage **3** so as to be moved in a main scanning direction is exemplified, but the invention is not limited thereto. For example, the invention may be applied to a so-called line type recording apparatus in which the ink jet type recording head **10** is fixed, and the printing is performed by only moving the recording sheet S such as paper in a sub scanning direction.

Further, the invention is made for methods of manufacturing, widely, general liquid ejecting heads and can be applied to methods of manufacturing a recording head such as various types of ink jet type recording heads used in an image recording apparatus such as a printer; a color-material ejecting head that is used in the manufacturing of a color filter such as a liquid crystal display; an electrode-material ejecting head that is used in the formation of electrode such as an organic EL display or a field emission display (FED); and a bio-organic substance ejecting head that is used in the manufacturing of a biochip.

Further, the invention is not limited to the flow path member mounted in the liquid ejecting head and the liquid ejecting apparatus, and can be applied to a flow path member mounted on devices other than the liquid ejecting head and the liquid ejecting apparatus.

What is claimed is:

1. A flow path member comprising:

a flow-path member main body provided with a liquid supplying path through which liquid is supplied to a head main body that ejects liquid and an attaching portion to which a liquid supplying unit that supplies liquid of the liquid supplying path is attached; and

a sealing member provided with an insertion hole into which the attaching portion is inserted, and is interposed between the liquid supplying unit and the attaching portion,

wherein a convex portion is provided in any one of the inner surface of the insertion hole and the outer surface of the attaching portion, and a concave portion that fits with the convex portion is provided in the other of the inner surface of the insertion hole and the outer surface of the attaching portion,

wherein the flow-path member main body and the sealing member are fitted by causing the convex portion to fit with the concave portion.

2. The flow path member according to claim **1**,

wherein the sealing member includes a base portion that is provided with the insertion hole, and a first lip that extends from the base portion to the liquid supplying unit to be in contact therewith.

3. The flow path member according to claim **2**,

wherein the sealing member further includes a second lip that is in contact with the flow-path member main body.

4. A liquid ejecting head comprising the flow path member according claim **3**.

5. A liquid ejecting apparatus comprising the flow path member according claim **3**.

6. A liquid ejecting head comprising the flow path member according claim **2**.

7. A liquid ejecting apparatus comprising the liquid ejecting head according to claim **6**.

8. A liquid ejecting apparatus comprising the flow path member according claim **2**.

9. The flow path member according to claim **1**,

wherein the convex portion is provided on the outer surface of the attaching portion, and

wherein the concave portion is provided on the inner surface of the insertion hole.

10. A liquid ejecting head comprising the flow path member according claim **9**.

11. A liquid ejecting apparatus comprising the flow path member according claim **9**.

12. The flow path member according to claim **1**,

wherein, when the sealing member is viewed from a point of the liquid supplying path extending toward the liquid supplying unit, the outer shape of the sealing member has a longitudinal direction and a short direction.

13. A liquid ejecting head comprising the flow path member according claim **12**.

14. A liquid ejecting apparatus comprising the flow path member according claim **12**.

15. The flow path member according to claim **1**,

wherein each of angles formed by three surfaces of the concave portion corresponding to the convex portion is an acute angle.

16. A liquid ejecting head comprising the flow path member according claim **15**.

17. A liquid ejecting apparatus comprising the flow path member according claim **15**.

18. A liquid ejecting head comprising the flow path member according claim **1**.

19. A liquid ejecting apparatus comprising the liquid ejecting head according to claim **18**.

20. A liquid ejecting apparatus comprising the flow path member according claim **1**.

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